

Note: OCV readings should be measured after at least 3 hrs. of disconnecting from charging or 1 hour of disconnecting from discharging.

7. Capacity Test

When a fully charged cell is discharged at a constant current of 10% of the rated capacity in amps, by putting adjustable load and proper calibrated ammeter, the discharge shall be stopped when the closed circuit voltage across the cell falls to 1.75 volts.

On the first discharge, the cell shall give not less than 85% of the rated capacity. The Cell/Battery shall give 100% rated capacity with in 5 discharges.

Full charged cell voltage = 2.13 V to 2.2V (Open circuit voltage)
Fully discharged cell voltage = 1.95 V(Open circuit voltage)
= 1.75V (Closed circuit voltage)

8. Maintenance

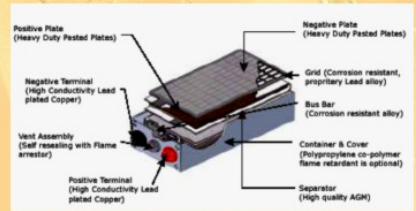
- Check voltage of the battery set once every week, or as per instructions issued by the Railways.
- Note down individual cell voltage readings every three months or as per instructions issued by the Railways.
- Check that physical condition of the battery is good, i.e. there are no cracks, bulges, leakage or unusual appearance and heating marks on it.
- Accurate reading digital multimeter are to be used for measurement of voltages and currents.
- Clean the entire battery box, terminals and connectors etc. on weekly basis or as and when dust accumulates.
- Gently clean the terminal post sulphation by using fine emery paper and then clean with dry cotton cloth.
- Re-torque the connections once every six months or as per instructions by the Railways.
- Keep records of all maintenance activity as recommended.

1. Introduction

The maintenance free Valve Regulated (Sealed) Lead Acid (VRLA) Stationary batteries, manufactured as per Specification No. IRS-S 93/96 Amdt. 1. by RDSO approved firms are available in standard sizes of:

Mono-block construction: 4V upto 300AH capacity, 6V upto 200AH capacity, 12V upto 120AH capacity and as required.

Stackable single cells: 2V cells of 20, 40, 80, 100, 120, 200, 300, 400, 500 AH. capacity.



2. Salient features

- No periodic topping up of electrolyte is required.
- Explosion resistant safety vents.
- Battery jar and cover are sealed hence no spillage of electrolyte.
- Superior lead cadmium alloy positive grids and lead-calcium alloy negative grids, hence maintenance free.
- Ready to use supplied in factory charged condition.
- Very low self-discharge rate.
- Self resealing and pressure regulating valve.

9. Do's

- Store the batteries in cool and dry location.
- Charge the batteries once every six months if stored for the longer period.
- Monitor the charge and float voltages of the power plant at monthly intervals and adjust, if required.
- Check the tightness of all electrical connections at monthly intervals.
- Always use suitable washers wherever bolt connections are provided.
- After a discharge, re-charge the batteries immediately.
- Check the compatibility of power plant and replace with the modified one if required.
- Maintain service record as per the instructions.

10. Don'ts

- Do not exceed the charging voltage above 2.30V maximum per cell.
- Do not open the safety valve for adding water or acid.
- Do not attempt to dismantle the battery.
- Do not boost charge the batteries for more than 12 hours.
- Do not mix ordinary conventional, low maintenance batteries with maintenance free VRLA batteries.
- Do not expose the packed batteries to rain and sunlight.
- Don't install batteries in room with varying temperature.
- Do not over tighten the terminals.
- Do not make tap connections.
- Do not tamper with the cell vents.

11. Recommended Tools

- Insulated Torque Wrench Set.
- Thermometer range 0-80 dec.C
- Rubber gloves.
- Digital Multimeter.
- Adjustable load for discharging battery.

12. Spares and Consumables

- Petroleum Jelly or Vaseline or non-oxidising grease.
- Nuts & bolts with suitable washers.
- Dry cotton cloth for cleaning.
- Cotton waste grade A
- Emery paper.

Annexure

Maintenance record

Nominal capacity of the battery.....
Nominal Voltage of the battery.....
Date of Installation.....
Ambient temperature.....

Cell No.	Voltage	Total battery voltage	Charger voltage in float mode	Charger Current

Remarks

Signature

Contact Person :
Director (S & T)
Phone : 0751-2470185
Fax : 0751-2470841
Email: indian_rail@dataone.in

• Both vertical and horizontal stacking of cells possible. Available in stackable steel trays.

• No toxic, corrosive acid fumes, hence no battery room required.

3. Effect on capacity when stored for long duration

The capacity loss for fully charged VRLA battery when stored is around 1% per week. The self discharge rate doubles for every 10 deg. C rise in temperature

Precautions and Charging interval for Idle Storage

S. No.	Temperature in Deg. C	Charging interval (Months)
1.	32	6.0
2.	37	4.5
3.	42	3.0
4.	47	2.25
5.	52	1.5

- Always store the batteries in covered area away from direct sunlight, rain, storm dust etc.
- VRLA batteries when stored for long duration freshening charge should be given as shown in the adjoining chart.

4. Installation

Install the battery in a clean, cool and dry location, an ideal temperature 27° C.

Free space of one meter should be provided on all sides of the battery for carrying out periodic checks.

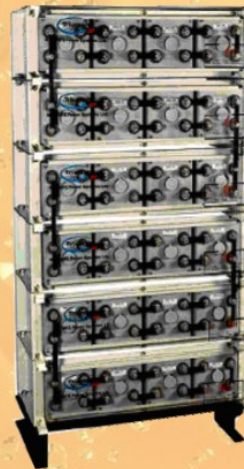
4.1 Stacking

Batteries are mounted on floor mounting channels. Batteries are to be stacked in Horizontal single stack (max.8 High) or Horizontal multiple stack (max. 8 High) as shown in next page

4.2 Connections

(i) **Inter-module:** Assemble the inter module connectors as per the wiring diagram with the help of the insulated tools. The upper bolts should be installed first to reduce accidental shorting.

(ii) **Inter stack:** Multiple horizontal stacks side by side are interconnected. Tighten all the connections to the torque of 11 N-m.



After attaining the battery set voltage for three consecutive hours, the switch to float mode (2.25V per cell) and connect the load.

5. Battery charging

Cells in the battery set should be of same type and capacity.

Charging individual cell separately is not advisable.

Connect the battery charger output terminals to the battery set with correct polarity. (i.e. Charger +ve to Battery +ve & Charger -ve to Battery -ve).

Connections should be tight and offer good conductivity.

5.1 Freshening Charging

Battery must be charged for the freshening charge if these are to be stored for longer duration.

Set the connected charger in constant potential mode. Set the voltage to 2.3 volts X No. of cells with the current limited to a maximum of 20 % of the rated capacity in Amps

5.2 Float Charging

In this operation, the battery is connected in parallel with a constant voltage charger and the critical load circuits.

Float Voltage setting at battery terminals-2.25V X No. of cells.

24 V system	27 Volts
110 V system	123.75 Volts
54 cell system	121.5V

Recommended float voltage per cell-2.25 V at 27 deg.C

Do not use float voltage lower or higher than those recommended. This will result in reduced battery capacity/ life.

5.3 Equalizing or Boost Charging

It is given when non-uniformity in voltage has developed between cells (more than 0.1V) or after every six months whichever is earlier. Determine the maximum voltage that may be applied to the system. (i.e. 2.30V X No. of cell).

Charge the cells for 21 hours with a voltage setting of 2.3V per cell in constant potential charging. The current limit should be 20% of the rated capacity in Amps.

Repeat the procedure till it reaches its rated capacity.

Boost Voltage setting at battery terminals-2.30V X No. of cells.


24 V system	27.6 Volts
110 V system	126.5 Volts
54 cell system	124.2 Volts

Recommended Boost voltage per cell-2.30 V at 27 deg.C.

6. Determination of state of Charge


The state of charge of VRLA battery can be determined by measuring the open circuit voltage (OCV) as per Table II.

% State of Charge	100	90	80	70	60	50	40	30	20	10	0
OCV +0.05 & -0.02	2.15	2.13	2.11	2.09	2.07	2.05	2.03	2.01	1.99	1.97	1.95




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GOVERNMENT OF INDIA
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VRLA BATTERY



CAMTECH/S/2007/VRLA/1.0
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